IV. Remarks

Claims 82 through 107 are pending in the application. Claims 82 through 107 have been cancelled. Claim 108 through 138 have been added.

Claim Objections

Claim 82 is objected to because of informalities. Specifically, in claim 82, line 4 "at lease" should be --at least--. Cancellation of claim 82 as mooted this claim objection. Claims 108 and 132 is based, to a great extent, on cancelled independent claim 82 and the recitation in line 4 regarding the first speed sensor appears as "at least."

Rejections Under 35 U.S.C. § 112

Claims 88, 89, 94 through 96 , 98 and 104 through 106 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. All of the claims rejected under 35 U.S.C. §112, second paragraph have been cancelled. Nonetheless, and as noted above, many of the cancelled claims find their analogs in the newly submitted claims and thus the rejections under 35 U.S.C. §112, second paragraph will be addressed. With regard to the minimum electrical current or minimum clutch engagement which the Examiner asserts, appears to be contradictory to the recitation of the independent claims, this is not so. The minimum electrical current or clutch engagement simply sets or achieves a base line or threshold clutch engagement such as 6%, 8%, 10% or 12%, for example, of clutch engagement and thus approximately corresponding torque transfer from the primary driveline through the secondary driveline under normal operating conditions. Viewed

from a slightly difference perspective, the claims did not and do not recite that there is no clutch engagement or torque transfer below the predetermined values or thresholds but rather that the clutch engagement and torque transfer increase after a predetermined or computed value is reached.

As to the reduction of steps associated with a minimum clutch current or engagement, this language acknowledges that a minimum clutch engagement of, for example, 10% may reduce the number of steps from, again by way of example 10 to 9 since it may be desirable to utilize the same percentage of a total for each step. However, if the steps begin at a 10% clutch engagement level rather than zero, they will therefore be fewer in number.

With regard to claim 98, the rejection has been mooted by the cancellation thereof.

Rejections Under 35 U.S.C. § 102

Claims 82, 85, 87, 88, 90, 91, 94, 96, 99, 102, 103, 104, 106 and 107 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. issued to Miller et al.

Although the claims rejected under Miller et al. have all been cancelled, since many of the newly submitted claims are based to a large extent upon those cancelled, it is appropriate to discuss and distinguish the Miller et al. reference. Miller et al. teach an early four wheel drive torque control system. The system utilizes prop shaft speed sensors (102, 104), a controller (100), a planetary gear center differential (38), and a modulatable clutch assembly (46) which is operably disposed across components of the center differential to increasingly inhibit differentiation as the clutch engages.

In contrast, Applicants' device lacks a center differential. This is no small distinction. In a four wheel drive system with a center differential, an unmodified or open differential functions just as a conventional rear axle differential does and allows speed differences between two axles: in the case of a center differential, the front and rear drive shafts. This allows a four wheel drive vehicle to safely navigate corners without wind-up of the front and rear drivetrains which would occur if no center differential were utilized and both prop shafts were commonly driven. The problem with such a system is that just as a conventional rear axle differential will do, a center differential will deliver all drive torque to the driveline (front or rear) whose tires are experiencing a lower coefficient of surface friction and which are thus either slipping or more prone to slip. If a vehicle with an open differential were placed with the front or rear tires on a dry surface with good traction and the other tires were placed on a low coefficient of friction surface such as ice, the delivered torque would spin the tires on the ice and the vehicle would not move.

This problem is solved by incorporating, as Miller et al. have done, a clutch disposed across two of the elements of the center differential which may be progressively engaged to progressively inhibit differentiation. In a high/low coefficient of friction situation as just described, the clutch may be engaged and the vehicle will readily move while all four wheels will have torque applied to them, at least two will traction on the surface and move the vehicle.

As noted, Applicants' device includes no center differential. The sole torque path between the primary and secondary drivelines is a modulating clutch: when the clutch is disengaged or opened, essentially no torque is provided to the secondary driveline and when the clutch is fully engaged, an effectively 50-50 torque split is achieved between the primary and secondary drivelines. Second of all, while the

Miller et al. clutch is accurately described as modulating or modulatable, the control scheme, the electrical current provided to it and the engagement program is distinct from Applicants'. As illustrated in Figure 9, and the text from column 16 at line 43 to column 17, lines 61 as well as much of column 18, describes the operation of the Miller et al. system. When wheel slip is detected, the magnitude of the wheel slip is utilized to determine a target torque command level. The modulatable clutch is then, as quickly as possible, energized and engaged to this torque command level which, in Figure 9, is designated the target torque level. The clutch engagement and target torque level are then maintained for a predetermined period of time based upon vehicle time constants and other empirically determined factors and the clutch is then de-energized. This cycle is repeated until slip is no longer detected.

The Miller et al. operational scheme is significantly different than that disclosed and claimed by Applicants. In the new claims, Applicants recite that the clutch has a minimum and maximum engagement level, that clutch engagement increases if a sensed speed difference is greater than a first predetermined value and the clutch engagement is less than the maximum engagement level and that clutch engagement decreases if said speed difference is less than a second predetermined value and the clutch engagement is greater than the predetermined minimum engagement value. Claim limitations also recite that these calculations and operations occur within predetermined times. Additionally, dependent claims further limit the invention and the predetermined values to values which are greater than, equal to or less than one another, that the first predetermined value reduces as a signal from a throttle position sensor increases and that the clutch provides a minimum level of engagement. These features are clearly not found in the Miller et

al. reference and thus a rejection for anticipation on Miller et al. under 35 U.S.C. § 102(b) is neither supported nor appropriate.

Rejections Under 35 U.S.C. § 103

Claims 83, 84, 89, 92, 93, 95, 97, 98, 100, 101 and 105 were rejected under 35 U.S.C. §103(a) as being unpatentable over Miller et al. The deficiencies of Miller et al. from the standpoint of anticipation are discussed directly above. A rejection for obviousness under 35 U.S.C. §103(a) on Miller et al. fares no better. At the heart of this failure are those teachings of Miller which first of all involve a four wheel drive torque distribution system utilizing a center differential but, more importantly, involve a system wherein torque is repeatedly provided and terminated at a fixed, initially determined level based upon wheel speed difference. The concept or disclosure, much less suggestion in Miller of minimum clutch engagement, and cycling or adjusting clutch engagement from a minimum to a maximum or vice versa during an operational cycle is nowhere to be seen. For at least the foregoing reasons, the presently submitted claims are not obvious in view of the Miller et al. reference under a proper interpretation of 35 U.S.C. §103(a) and should be allowed.

SUMMARY

Pending Claims 108 through 138 as amended are patentable. Applicants respectfully request the Examiner grant early allowance of these claims. The Examiner is invited to contact the undersigned attorneys for the Applicants via telephone if such communication would expedite this application.

Respectfully submitted,

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Date

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